# Biomedical Images for Simulation and Analysis of Surgical Procedures



Nakao, Megumi; Matsuda, Tetsuya

*日本生体医工学会 専門別研究会 生体医用画像研究会*
*若手発表会 2016/3*
***Proceedings of Medical and Biological Imaging - JSMBE 2016/3*** ***JSMBE-MBI2015-08 (2016-03)***

# Biomedical Images for Simulation and Analysis of Surgical Procedures

Megumi Nakao * and Tetsuya Matsuda *

* Graduate School of Informatics, Kyoto University, Sakyo, Kyoto, Japan.

## Abstract

Virtual planning and preoperative simulation using computed tomography (CT) or magnetic resonance (MR) images enable quantitative, strategic planning of patient-specific surgical procedures. To perform evidence-based surgery and standardization of surgical procedures, the interest for an image-based estimator is increasing among surgeons and researchers. Statistical analysis of the surgical planning data and investigation of implicit factors affecting the decision-making are also important for designing next-generation planning/navigation system.

In this presentation, we will introduce our recent study on surgical process modeling and analysis using medical images. The concept of deformable resection process map [1] for tumor resection in abdominal/thoracic surgery is first introduced. (see Figure 1) Second, a user experiment to quantitatively analyze surgical process and decision-making in mandibular reconstructive surgery [2] is reported. Importance of simulation as a tool for coupling medical knowledge to machine learning will be discussed.

**Keywords**: Surgical process analysis, semi-automatic planning

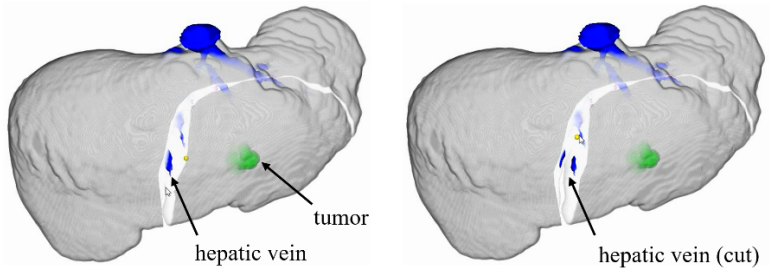


Fig. 1 Deformable resection process map as an intraoperative guide.

[1] M. Nakao, Y. Oda, K. Taura, and K. Minato, "Direct volume manipulation for visualizing intraoperative liver resection process", Computer Methods and Programs in Biomedicine, Vol. 113, No. 3, pp. 725-735, 2014.
[2] M. Nakao, M. Hosokawa, Y. Imai, N. Ueda, T. Hatanaka, T. Kirita and T. Matsuda, "Volumetric fibular transfer planning with shape-based indicators in mandibular reconstruction", IEEE Journal of Biomedical and Health Informatics, Vol. 19, No.2, pp.581-589, 2015.